PRELIMINARY HYDROGEOLOGIC INVESTIGATION
SAUGET PLANT SITE
Phase I

Proposal
Not Done

submitted to

CERRO COPPER PRODUCTS COMPANY

SAUGET, ILLINOIS

October 29, 1986

Sverdrup
CORPORATION
801 North Eleventh
St. Louis, Missouri 63101
314 436-7800

October 29, 1986

Cerro Copper Products Company
P.O. Box 681
East St. Louis, Illinois 62202

Attention: Mr. Sandy A. Silverstein
Manager, Energy and Environmental Affairs

Gentlemen:

Subject: Proposal for Preliminary Hydrogeologic Investigation
Sauget Plant

Sverdrup is pleased to submit this proposal for a preliminary hydrogeologic investigation on the property owned by Cerro Copper Products Company in Sauget, Illinois. We are experienced in all aspects of the work required and are prepared to assign our most capable personnel, as defined in Section III of our proposal.

The work proposed is considered to be a preliminary phase of a full-scale remedial investigation (RI) of the Cerro Sauget Plant property. It is designed to mesh as much as possible with the full-scale RI. Section I of our proposal demonstrates our understanding of the purpose and requirements of the investigation. Section II communicates the approach we plan to use.

We anticipate using three subcontractors to assist us during the investigation; one for the installation of monitoring wells, one for the chemical analysis, and one for the testing of soil samples. The selection of these subcontractors will be subject to Cerro's approval.

The general schedule presented in Section IV represents our best estimate of the sequence and duration of the work required. We must point out, however, that the nature of the work lends itself to unpredictable delays that can sometimes make truely realistic schedules hard to meet. Nevertheless, we will work as diligently as possible to meet the proposed schedule.

The costs presented in Section V represent our estimate of the compensation required for the investigation. As with our previous contracts with Cerro, we propose to provide our services on a cost-reimbursable basis as described in the standard contract provisions included in Section V.

Our work proposal and our estimated costs are based on the indemnification conditions described in Section V.

We are most interested in assisting Cerro in this investigation, and we look forward to working with you on all phases of the remedial investigation work. Please contact me should you need additional information during your evaluation.

Sincerely yours,

SVERDRUP CORPORATION

Jules B Cohen

Jules B. Cohen
Vice President

cc: Paul Tandler, Cerro Copper Products

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FIGURES

TABLES

I. BACKGROUND

Cerro Copper Products Company currently owns three parcels of property in the Village of Sauget, Illinois (see Figure 1 in Section II). The largest parcel, located between Mississippi Avenue on the west and Monsanto Avenue on the east, is the site of the active secondary copper processing operations (the Cerro Sauget Plant). The small triangular parcel just south of New Queeny Avenue is undeveloped and not presently utilized by Cerro. The rectangular parcel west of Mississippi Avenue opposite the active copper processing facilities is also inactive. This parcel was formally owned by the Darling Fertilizer Company and was used as a fertilizer manufacturing facility.

In 1980, the Illinois Environmental Protection Agency (IEPA) was made aware of potential dangerous soil and water pollution problems in Dead Creek just south of the Cerro Sauget Plant. A hydrogeologic investigation was conducted by IEPA in 1980 that included soil, groundwater, surface water, and sediment sampling on and around the Cerro property east of Mississippi Avenue. The investigation identified several previous dump sites on the Cerro property and found that significant organic and inorganic chemical contamination existed in the holding ponds (Dead Creek) on the Cerro property. As a result of the findings, IEPA fenced off part of Dead Creek south of New Queeny Avenue, and they recommended that the groundwater in the area not be used for human consumption and that a further detailed study be undertaken.

In 1981, USEPA conducted additional limited investigations and installed a permanent chain-link fence to limit access to Dead Creek south of the Cerro property.

In April 1985, IEPA issued a Request for Proposal for a Remedial Investigation/Feasibility Study (RI/FS) for the Sauget and Cahokia, Illinois area, which included the Cerro property east of Mississippi Avenue. A contract for the work was awarded to Ecology and Environment (E&E) about mid-1985.

On November 21, 1985, E&E attempted to begin work on Cerro property in the study area but was refused access by Cerro management pending the filing of a Formal Consent of Entry Agreement. Following several rounds of communications between IEPA and Cerro, Cerro drafted a Consent to Access agreement and presented it to IEPA for review and adoption. As of October 2, 1986, IEPA had not responded to the agreement as proposed by Cerro.

On October 2, 1986, Paul Tandler and Sandy Silverstein of Cerro and Jules Cohen, Ed Preissner, and Larry Oliver of Sverdrup met to discuss the IEPA RI/FS study. As a result of the meeting, Cerro requested that Sverdrup prepare two proposals to conduct work on the Cerro property related to the IEPA RI/FS. One proposal was to be for a preliminary and cursory hydrogeologic investigation to provide data on the general condition of the groundwater, soil, surface water, and sediment on the Cerro property. The purpose of the investigation was to qualitatively

determine if and to what extent chemical contamination is present on the property owned by Cerro. The second proposal was to be for a full-scale remedial investigation on Cerro property patterned after the work proposed by E&E for the IEPA RI/FS study.

This proposal is for the preliminary hydrogeologic investigation. It is based on the transfer of information during the October 2 meeting, the review of the IEPA report for the 1980 preliminary hydrogeologic investigation, the IEPA RFP for the RI/FS, the E&E proposal for the RI/FS, a site inspection on October 17, 1986, and subsequent telephone discussions with Cerro personnel.

II. TECHNICAL APPROACH

Sverdrup's technical approach for the Cerro Sauget Plant Site Preliminary Hydrogeologic Investigation involves the following general areas of activity:

1. Conducting an information search to compile a historical record and quantify subsurface risks for the property currently owned by Cerro.

2. Preparing for field work.

3. Installing monitoring wells for the purpose of sampling the groundwater under Cerro property.

4. Sampling several existing monitoring wells installed during the 1980 hydrogeologic investigation in the general plant area conducted by IEPA.

5. Sampling one of Cerro's existing deep wells.

6. Sampling the surface water and bottom sediment in Dead Creek both on and off Cerro property.

7. Collecting soil samples at several locations on Cerro property.

The work proposed is designed to provide background information for a full-scale remedial investigation to be defined in a separate proposal. The overall work effort for this investigation and the remedial investigation has been sequenced into three phases. This investigation represents the first phase of the overall effort.

The work proposed for this investigation is defined below. Figure 1 serves as the principal reference for the discussion.

A. INFORMATION SEARCH

An important aspect of any work involving drilling in a site identified as a potential dumpsite for hazardous materials is to gather available historical information on the area and on the previous work conducted in the area. The information serves to provide direction and confidence in the subsurface work to be accomplished and increases the safety to both people and the environment during the progress of the work. To accomplish this, the following tasks will be performed:

1. Review all available information in the possession of Cerro Copper Products Company regarding land ownership, land acquisition, and land use for the property previously and currently owned by Cerro.

2. Review local, state, and federal government files for land ownership and land use information for the study area and for

information from any previous studies related to the purpose of this study; including geologic, hydrologic and other investigations of the vicinity.

3. Interview available persons that may be knowledgeable about the activities taking place on the property previously and currently owned by Cerro.

4. Compile all information obtained into a logical and useful format to serve as a background document for the overall investigation.

The information search will primarily cover the Cerro property. Additional search will likely be necessary during the full-scale remedial investigation to cover adjoining properties.

B. PREPARATION FOR FIELD WORK

Proper planning and preparation are important to the successful and safe completion of any investigation involving potentially hazardous materials. This tends to reduce the amount of time required to accomplish the field work, provide the data required, and greatly reduces the risk of spreading contamination and exposure. In this regard, the following tasks will be performed under this activity:

1. Develop a comprehensive work plan and schedule.

2. Develop a site health and safety plan.

3. Establish each sampling location, physically locate and identify utilities at the site, and prepare sites for well installation and/or sampling as required.

4. Contract with an experienced union drilling contractor to perform the drilling, soil sampling, and monitoring well installation work required.

5. Contract with an IEPA approved analytical laboratory to perform the analytical work required on the samples collected during the investigation.

6. Contract with a soils testing laboratory to perform the testing required on the soil samples collected during the investigation.

C. DATA COLLECTION

Although IEPA will not be involved in this phase of the overall remedial investigation, all sampling and data collection will be performed in accordance with current IEPA requirements. The costs for drilling and sampling are based on the use of Level B protection, which includes self-contained breathing equipment and complete but not fully encapsulating protective clothing. It is, however, anticipated that downgrading to Level D protection may be possible at least on the parcel west of Mississippi Avenue. Level D protection is similar to that used

by Sverdrup during the Wastewater Characterization Study. Any downgrading will be reflected in the actual charges to the project.

GROUNDWATER SAMPLING

As illustrated in Figure 1, six wells will be used to sample groundwater during the investigation. The purpose and work requirements for each well are described below.

Well W1 (New Well)

The purpose of Well W1 is to quantitatively establish the quality of the groundwater in the upper layer of the Henry Formation aquifer at the location where the groundwater enters the Cerro property from the northeast. This will indicate whether or not contamination exists upgradient of the Cerro property. The following work is required to sample this well:

1. Install well as specified in Figure 2. In the process of installation, collect soil samples of the aquitard and aquifer for analysis and well design. In the aquitard, use a continuous sampler to totally recover the low permeable soils for a detailed visual examination. In the aquifer, use a split-spoon sampler to collect interval samples for classification and geotechnical testing.

2. Develop the well and collect one groundwater sample.

Well W2 (New Well)

The purpose of Well W2 is to quantitatively establish the quality of the groundwater in the upper layer of the Henry Formation aquifer west of the Cerro holding ponds (Dead Creek) and downgradient of Well W1. This will indicate whether or not contamination exists downgradient of the holding ponds and the identified dump sites just east of the holding ponds. The same work identified for Well W1 is required for this well.

Well W3 (Existing Well)

Well W3 is an existing well that was placed during the 1980 hydrogeologic investigation by IEPA. This well will be sampled to quantitatively establish the quality of the groundwater in the upper layer of the Henry Formation aquifer at the location where the groundwater leaves the Cerro property to the southwest. This will establish whether or not contamination exists downgradient of the Cerro property. The following work is required to sample this well:

1. Purge the well and collect one groundwater sample.

Well W4 (Existing Well)

Well W4 is an existing abandoned well previously used by Cerro for plant water. This well will be sampled to quantitatively establish the quality of the deep groundwater under the Cerro property. The following work is required to sample this well:

1. Ready the well for sampling by removing pump head, shaft, and bowl. (This work to be performed by Cerro.)

2. Purge the well and collect one groundwater sample.

Well W5 (New Well)

The purpose of Well W5 is to quantitatively establish the quality of the groundwater in the upper layer of the Henry Formation aquifer at the western end of the Cerro parcel on the west side of Mississippi Avenue (the property formally owned by Darling Fertilizer). This will indicate whether or not contamination exists at this location and help establish the level of concern required in this area during future phases of the overall investigation. The same work identified for Well W1 is required for this well.

Well W6 (Existing Well)

Well W6 is an existing well that was placed during the 1980 hydrogeologic investigation by IEPA. It was identified as a background well during that investigation. The well is to be sampled to provide background data on the groundwater in the area. The following work is required to sample this well:

1. Obtain permission from IEPA and the property owner on which the well is located.

2. Purge the well and collect one groundwater sample.

SOIL SAMPLING

As illustrated in Figure 1, shallow soil samples will be collected at four locations on the Cerro property. The samples will be collected over a depth of approximately ten feet by means of a hand auger and appropriate soil sampler. Composite samples will be prepared at each location. One composite will be prepared from the samples collected on the small triangular parcel just south of New Queeny Avenue. Individual composites will be prepared for the samples collected on the parcel west of Mississippi Avenue. No geotechnical testing will be performed on these samples.

SURFACE WATER SAMPLING

As illustrated in Figure 1, surface water samples will be collected at six locations on the Cerro property. Except for volatile organic analysis, composite samples will be prepared from the three samples north of the Cerro plant road and from the two samples between the plant road and New Queeny Avenue.

The surface water samples will quantitatively establish the quality of the water in the Cerro holding ponds (Dead Creek) and in Dead Creek downstream of the ponds. This will establish the significance of the holding ponds with regard to any groundwater contamination that might

exist and identify if the ponds are leaking into Dead Creek south of New Queeny Avenue.

SEDIMENT SAMPLING

As illustrated in Figure 1, sediment samples will be collected at six locations on the Cerro property. These samples will be collected from the same sample areas as the surface water samples. Composite samples as defined for the surface water samples, will be prepared for the sediment samples.

The sediment samples will quantitatively establish the level of contamination that might exist in the sediment of the Cerro holding ponds and in Dead Creek on the Cerro property just south of New Queeny Avenue.

D. SAMPLE ANALYSIS AND TESTING

WATER SAMPLES

The following water samples will be analyzed according to USEPA protocol for the pollutant parameters listed in Tables 1, 2, and 3:

Number	Source	Description
1	Well W1	Upper Layer Groundwater
2	Well W2	Upper Layer Groundwater
3	Well W3	Upper Layer Groundwater
4	Well W4	Deep Groundwater
5	Well W5	Upper Layer Groundwater
6	Well W6	Upper Layer Groundwater
7	Holding Pond	North End Surface Water Composite
8	Holding Pond	South End Surface Water Composite
9	Dead Creek	Surface Water South of New Queeny Avenue
10	Well W2	Upper Layer Groundwater (Duplicate of Number 2)

SOIL SAMPLES

Based on Sverdrup's technical approach, soil samples will be collected during the installation of the new monitoring wells and from the shallow hand auger sampling locations. Representative samples will be physically classified and tested for the properties listed below according to standard ASTM procedures. The number of tests assumed in developing the collection and laboratory costs are noted in parenthesis.

- Specific gravity (5)
- Water content (25)
- Particle size analyses (8)
- Permeability (3)
- Porosity, void ratio (4)
- Atterberg limits (4)

The following soil samples will be analyzed according to USEPA protocol for the pollutant parameters listed in Tables 1, 2, and 3:

Number	Source	Description
1	Well W1	Ground Surface
2	Well W1	Below Surface Composite
3	Well W2	Ground Surface
4	Well W2	Below Surface Composite
5	Well W5	Ground Surface
6	Well W5	Below Surface Composite
7	Triangular Parcel	Composite
8	Rectangular Parcel	Composite (west location)
9	Rectangular Parcel	Composite (east location)
10	Well W2	Below Surface Composite (Duplicate of Number 4)

SEDIMENT SAMPLES

The following sediment samples will be analyzed according to USEPA protocol for the pollutant parameters listed in Tables 1, 2, and 3:

Number	Source	Description
1	Holding Pond	North End Composite
2	Holding Pond	South End Composite
3	Dead Creek	South of Queeny Avenue

E. COMPILE AND REPORT FINDINGS

In addition to the background document to be prepared under the Information Search, Sverdrup will compile all field information and analytical results in a report format for presentation to Cerro. The following general tasks will be performed under this activity:

1. Prepare a report to describe the field and analytical activities and summarize the findings of the investigation. Provide five copies to Cerro Copper.

2. Discuss the findings and conclusions of the report with Cerro and designated Cerro Copper representatives.

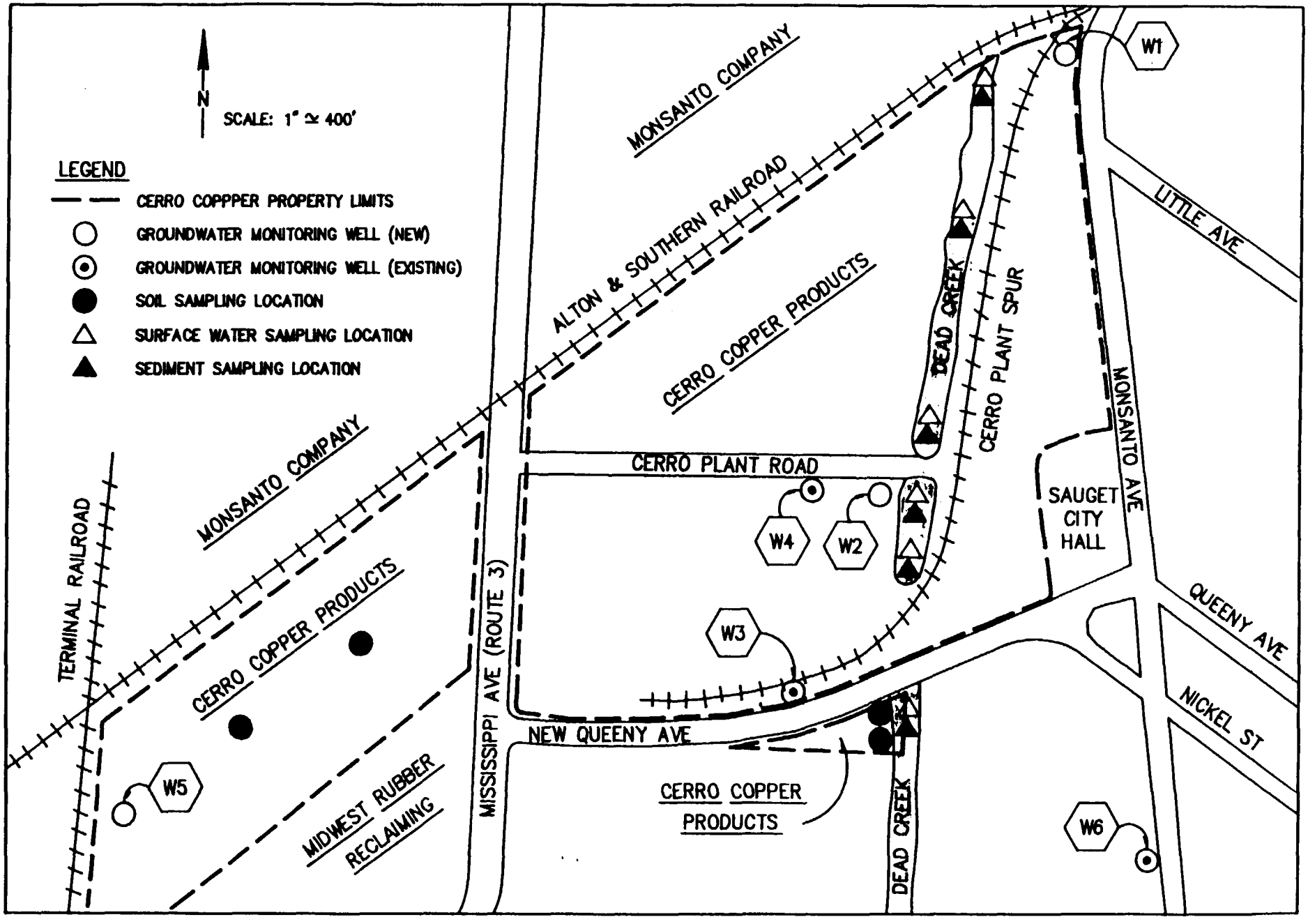

FIGURE 1. SITE MAP AND PROPOSED SAMPLING LOCATIONS

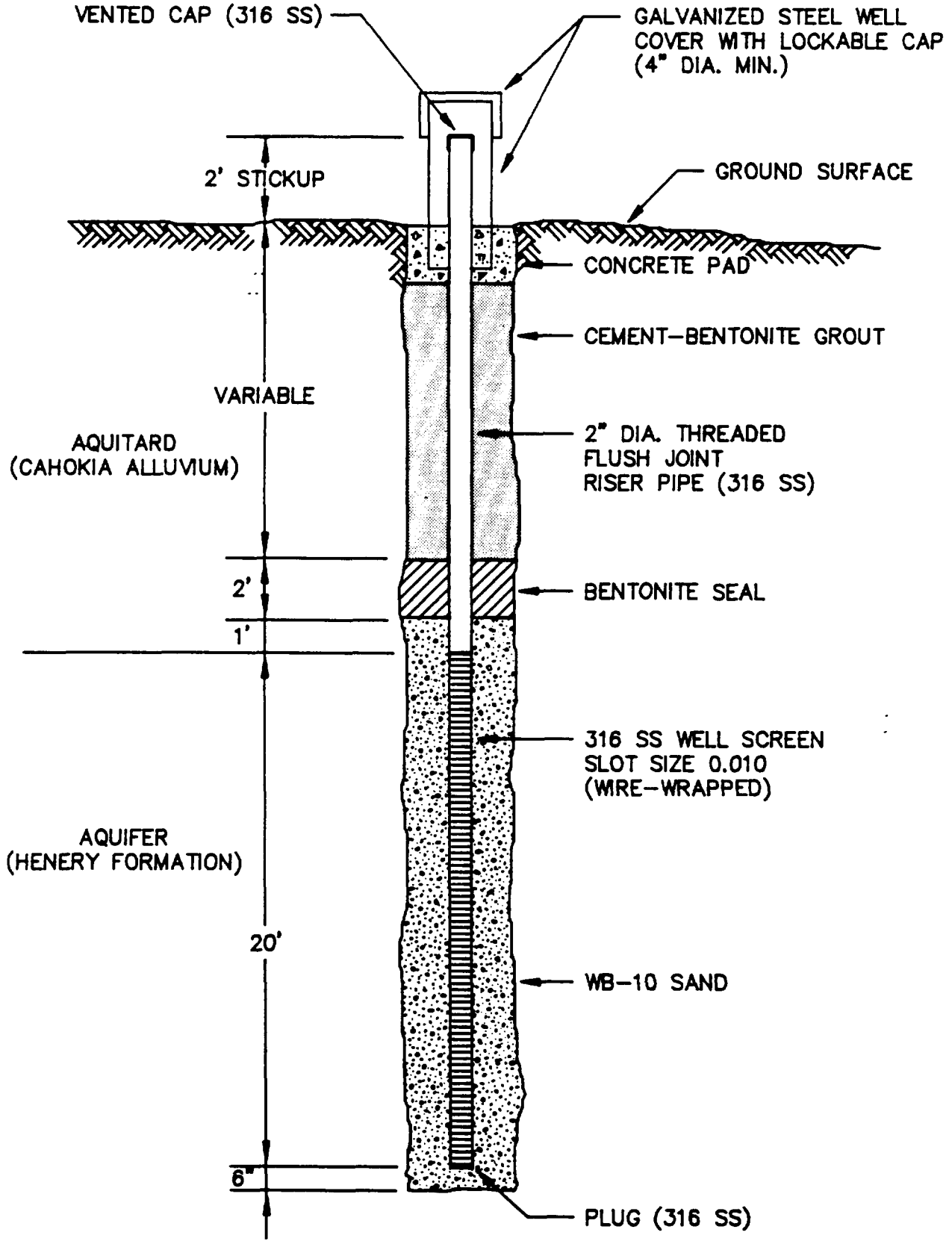

FIGURE 2. TYPICAL MONITORING WELL INSTALLATION

TABLE 1
USEPA PRIORITY POLLUTANTS

ORGANICS

Volatiles
acrolein
acrylonitrile
benzene
carbon tetrachloride
chlorobenzene
1,2-dichloroethane
1,1,1-trichloroethane
1,1-dichloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
chloroethane
2-chloroethylvinyl ether
chloroform
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
trans-1,3-dichloropropene
cis-1,3-dichloropropene
ethylbenzene
methylene chloride
chloromethane
bromomethane
bromoform
bromodichloromethane
chlorodibromomethane
tetrachloroethene
toluene
trichloroethene
vinyl chloride

Acid Compounds
2,4,6-trichlorophenol
p-chloro-m-cresol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-2-methylphenol
pentachlorophenol
phenol

Base/Neutral Compounds
acenaphthene
benzidine
1,2,4-trichlorobenzene
hexachlorobenzene
hexachloroethane
bis(2-chloroethyl)ether
2-chloronapthalene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3'-dichlorobenzidine
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
fluoranthene
4-chlorophenyl phenyl ether
4-bromophenyl phenyl ether
bis(2-chloroisopropyl) ether
bis(2-chloroethoxy) methane
hexachlorobutadiene
hexachlorocyclopentadiene
isophorone
naphthalene
nitrobenzene
N-nitrosodiphyenylamine
N-nitrosodipropylamine
bis(2-ethylhexyl) phthalate
benzyl butyl phathalate
di-n-butyl phthalate
di-n-octyl phthalate
dimethyl phthalate
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
chrysene
acenaphthylene
anthracene
benzo(g,h,i)perylene
fluorene
phenanthrene
dibenzo(a,h)anthracene
indeno(1,2,3-c,d)pyrene
pyrene

Pesticides
aldrin
dieldrin
chlordane
4,4'-DDT
4,4'-DDE
4,4'-DDD
alpha-endosulfan
beta-endosulfan
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide
alpha-BHC
beta-BHC
gamma-BHC
delta-BHC
PCB-1242
PCB-1254
PCB-1221
PCB-1232
PCB-1248
PCB-1260
PCB-1016
toxaphene

INORGANICS
Aluminum
Chromium
Barium
Beryllium
Cobalt
Copper
Iron
Nickel
Manganese
Zinc
Boron
Vanadium
Arsenic
Antimony
Selenium
Thallium
Mercury
Tin
Cadmium
Lead
Cyanide

TABLE 2
IEPA NONPRIORITY POLLUTANTS

ORGANICS

Volatiles	Acid Compounds	Base/Neutral Compounds
acetone	benzoic acid	aniline
2-butanone	2-methylphenol	benzyl alchohol
carbondisulfide	3-methylphenol	4-chloroaniline
2-hexanone	4-methylphenol	dibenzofuran
4-methyl-2-pentanone	2,4,5-trichlorophenol	2-methylnapthalene
styrene		2-nitroaniline
vinyl acetate		3-nitroaniline
xylene		4-nitroaniline

TABLE 3
OTHER POLLUTANT PARAMETERS

WATER SAMPLES

pH (Field)
Temperature (Field)
Conductivity
Alkalinity
Total Dissolved Solids

III. PERSONNEL

The investigation will be conducted by Sverdrup's Environmental Division under the direction of Dr. Jules Cohen. Assistance will be provided by our Geotechnical Engineering Group.

The investigation will be under the direct technical control of Mr. Edgar Preissner, Sverdrup's environmental principal for hazardous waste management. He will direct our project manager on all technical aspects of the investigation.

Mr. Larry Oliver will serve as our Project Manager. He will work directly with Cerro personnel on all aspects of the works. Mr. Steve Hornung and Mr. Murray Meierhoff of Sverdrup's Environmental Division and Mr. Dennis Boll of Sverdrup's Geotechnical Engineering Group will assist Mr. Oliver in the conduct of the work.

The qualifications and experience of these personnel are included in the form of resumes for your review.

JULES B. COHEN

VICE PRESIDENT, ENVIRONMENTAL DIVISION

Joined Sverdrup in 1979 as Director of the Environmental Laboratory. Became division manager in 1985. Responsible for activities of Sverdrup's Environmental Division.

Professional History

Dr. Cohen was previously Vice President and Director of the Sverdrup Environmental Laboratory at Sverdrup Technology, Inc., Tullahoma, Tennessee. Responsible for laboratory analytical services and environmental engineering studies. Prior to this, he was Deputy Assistant Director for Technical Support, EPA, National Enforcement Investigations Center (NEIC), Denver, Colorado, where he directed laboratory analytical services for all environmental media, the remote-sensing program, and computer technical information services. As Technical Coordinator, EPA NEIC in Denver, Dr. Cohen assisted in coordinating the planning and conduct of studies assessing the impact of industrial and municipal wastewater, air, water, toxic substances, and radiological pollutants on the environment. While Chief, Environmental Sciences Branch, Arctic Health Research Center, Fairbanks, Alaska, Dr. Cohen directed staff conducting research, demonstration projects, and technical assistance toward the solution of environmental health engineering problems of high latitudes and low temperatures. He also taught graduate engineering at the University of Alaska.

Earlier, Dr. Cohen was a Senior Sanitary Engineer with the U.S. Public Health Service at the R. A. Taft Sanitary Engineering Center, directing research and field surveys of water pollution and applying digital computer techniques to stream sanitation and water pollution control.

Recent experience includes consulting services for the Resource Conservation and Recovery Act (RCRA), an environmental audit of NASA's Goddard Space Flight Center, investigations for radioactivity at a school facility in Missouri, and expert witness on water quality chemistry.

Professional Background

Registered Professional Engineer in Tennessee and Colorado
Diplomate, American Academy of Environmental Engineers (AAEE)
Ph.D., Environmental Health Engineering - California Institute of Technology, Pasadena, California, 1965
M.S., Civil Engineering - University of Colorado, Boulder, Colorado, 1958
B.C.E., Civil Engineering, City College of New York, New York, NY, 1955
EPA Bronze Medal for Commendable Service, 1978
Patent, EPA Stage II Vapor Recovery Test Procedure, 1978
USPHS Commissioned Officer Award, 1979
Entered the profession in 1955; joined Sverdrup in 1979

Other Activities

Member, AAEE Adhoc Committee on Hazardous/Toxic Waste Management
Member, EPA Environmental Engineering Peer Review Panel
Former member, Tennessee Air Pollution Control Board
Served as a consultant to the EPA Science Advisory Board and to the Tennessee Department of Public Health
Former member, Surface Water Quality Committee, International Poplar River Water Quality Board of the International Joint Commission

EDGAR D. PREISSNER

Environmental Principal, Hazardous Waste Management

Specialized Professional Competence

Hazardous waste engineering
Project management
Regulatory guidelines
Wastewater treatment

Representative Project Experience for Others

Management, including profit and loss responsibility, of waste landfill operation consisting of 65 disposal sites nationwide, with gross annual revenues of $65 million. Managed field operations through eight regional managers. Upgraded equipment program and directed development of personnel training, maintenance, and operations manuals. Managed CERCLA and RCRA compliance programs, filing of Part As and Bs, review and development of new landfill designs and plans for operations and closures, and development of remedial designs and corrective construction

Managed design, engineering, operation, and construction of 100-acre waste landfill. Total height of fill was 180 feet, with portion of excavation beneath groundwater table

Developed program management systems for federal study of industrial and hazardous waste impacts on Great Lakes. Established project goals and schedules and developed preliminary data base. Formulated computer model to forecast waste dispersion and impacts

Wrote and implemented engineering study program for assessing industrial and hazardous waste discharges, impact on environment, and judicial source documentation

Evaluated management techniques, and the application of integrated logistic support (ILS) for major projects such as the U.S. Department of Energy's $6 billion Strategic Petroleum Reserve

Managed engineering group for industrial waste site engineering studies and remediation programs. Developed air dispersion computer modeling for waste discharges

In charge of operation and engineering group, with profit and loss responsibility. Directed the design, engineering, and construction of waste processing plants. Implemented effective project planning and management. Implemented projects in Algeria, Brazil, Greece, and Belgium

Professional Background

Registered Professional Engineer in Illinois
MBA in Finance, University of Chicago, 1973
MS in Civil Engineering, University of Wisconsin, 1964
BS in Civil Engineering, Northwestern University, 1961
Entered the profession in 1961; joined Sverdrup in 1986
Member - National Society of Professional Engineers
- American Society of Civil Engineers
- Water Pollution Control Federation

LARRY J. OLIVER

Project Engineer, Environmental Division

Specialized Professional Competence

Municipal and industrial wastewater treatment
Environmental studies and preparation of regulatory documents
Sewer system design
Project management
Plant start-up

Representative Project Assignments

Project engineer for:
- Preliminary and final design of 28-mgd Missouri River Wastewater Treatment Plant for Metropolitan St. Louis Sewer District (MSD), MO
- Design of 6.8-mile Creve Coeur Creek interceptor sewer for St. Louis MSD
- Design of 1.5-mgd industrial wastewater pretreatment facility, 3,000 gpm pumping station, and 12-inch force main for Monsanto Chesterfield Village Research Center
- Design of 2.5-mgd wastewater treatment plant for St. Louis MSD, Caulks Creek watershed, St. Louis County, MO
- Effluent guidelines, new source performance standards, and pretreatment standards studies of textile mills industry for U.S. Environmental Protection Agency (EPA)
- Hazardous waste studies to assess impact of regulations under Resource Conservation and Recovery Act on textile mills industry for U.S. EPA
- Operations investigation and evaluation of design change alternatives for the sewage treatment system at Union Electric Co's Callaway County (MO) nuclear power plant

Design responsibility during construction and start-up phases of the sewage treatment and potable water systems at Union Electric Co's Callaway County (MO) nuclear power plant

Start-up assistance for:
- 70-mgd Eugene-Springfield municipal secondary wastewater treatment facility in Eugene, OR
- 6-mgd Miller Brewing Company industrial water treatment facility in Trenton, OH

Preparation of operations manual supplement and industrial pretreatment program for expansion to City of Perryville, MO wastewater treatment plant

Operations assistance for 80,000 gpd packaged treatment facility located at Union Electric Company nuclear power plant, Callaway County, MO

Representative Project Assignments for Others

Commissioned Officer, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 1970-1974

Professional Background

Registered Professional Engineer in Missouri
MS in Engineering Management - University of Missouri, 1983
MS and BS in Civil Engineering - University of Missouri, 1976 and 1970
Entered the profession in 1970; joined Sverdrup in 1976
Technical publication, Journal of the Water Pollution Control Federation, 1980
Member - American Society of Civil Engineers
- National Society of Professional Engineers
- Water Pollution Control Federation
- Engineer's Club of St. Louis

STEVEN M. HORNUNG

Environmental Engineer

Specialized Professional Competence

Water and wastewater treatment
Activated alumina adsorption
Hazardous waste regulations
Water, wastewater, and hazardous waste sampling

Representative Project Assignments

Project manager for contamination assessment and remedial action feasibility study at railroad fueling facility, Dupo, IL
Design engineer on potable water treatment and distribution system at Anheuser-Busch land application site, Jacksonville, FL
Project engineer for hazardous waste audits at industrial plants, St. Louis, MO
Engineer for design of 28-mgd Missouri River secondary treatment plant, Metropolitan St. Louis Sewer District (MSD), St. Louis, MO

Representative Project Assignments for Others

Engineer performing preliminary assessments and site inspections at potential hazardous waste sites, Mississippi and Alabama
Prepared site safety and sampling plans for hazardous waste inspections, Mississippi and Alabama
Project engineer for design of recycling system for process water at veneer manufacturer, Waynesboro, MS

Professional Background

Engineer-in-Training in Missouri
MS and BS in Civil Engineering - University of Missouri-Columbia, 1984 and 1982
Technical presentation on removing selenium from drinking water by adsorption using activated alumina at the AWWA Convention, 1983
Entered the profession in 1984; joined Sverdrup in 1985
Member - American Society of Civil Engineers
- American Water Works Association
- Water Pollution Control Federation
- Hazardous Materials Control Research Institute

MURRAY L. MEIERHOFF

Environmental Scientist

Specialized Professional Competence

- Hazardous waste impact assessment, including coverage under RCRA and CERCLA
- Water quality surveys and assessment
- Water quality standards review
- NPDES discharge permit limitations compliance studies
- Field sampling

Representative Project Assignments

- Remedial investigations and feasibility studies for Missouri Pacific Railroad in Dupo, IL for hydrocarbon contamination in soils and groundwater. Other contaminants include PCB's, phenols, and cyanides
- Performed site investigation of suspected hazardous waste dump in western Tennessee to establish the presence and extent of buried drums and associated groundwater contamination
- Conducted an assessment of an industrial wastewater treatment system in Mississippi to determine whether the system was subject to RCRA regulations, and whether a waiver provision could be obtained
- Maintained an update file on all amendments and changes to RCRA and CERCLA

Representative Project Assignments for Others

- Review and revision of State of Iowa's water quality standards as a member of the Iowa Water Quality Review Subcommittee
- Participant in the State of Iowa's Section 208 non-point source runoff surveys of small- and medium-size watershed basins in rural Iowa
- Field sampling to determine NPDES discharge permit compliance of numerous industrial and municipal wastewater treatment facilities in Iowa
- Collection, identification, and data interpretation of water, fish, and benthic macroinvertebrate samples to assess possible impacts from hazardous waste site leachate on the Cedar River, Charles City, IA

Professional Background

- MA in Aquatic Biology and BA in Zoology - University of Missouri-Columbia, 1977 and 1974
- Entered the profession in 1977; joined Sverdrup in 1981
- Numerous professional publications
- Hazardous Materials Handling Course reflecting requirements of EPA 1440.2- Health and Safety Requirements for Employees Engaged in Field Activities, and 1440.3 - Respiratory Protection, and EPA's Standard Operating Guides
- Member - North American Benthological Society
- Past Member - Iowa Water Quality Standards Revision Subcommittee (1980) of the Iowa Water Quality Commission

DENNIS F. BOLL

Geotechnical Engineer - Hydrologist

Specialized Professional Competence

Planning and supervising subsurface and groundwater investigations
Geotechnical analyses and engineering
Hazardous waste management and investigations

Representative Project Assignments

Project engineer for permit applications assistance at TRADCO, Inc.'s, Washington, MO landfill. Responsibilities included geotechnical investigations, installation of monitoring wells and recommendations for design and construction of landfills

Project engineer for hydrogeologic investigation involving mine tailings impoundment for a confidential client. Project included computer modeling, aquifer resource evaluation, and seepage analysis

Project engineer for groundwater and soil contamination investigations for a major chemical producer at plants in New Jersey, South Carolina, Illinois, Idaho, Texas, and Ohio. Mr. Boll has been involved full time on this assignment for the last 14 months. His work involves supervising soil, hazardous waste, and groundwater sampling; installation of monitoring systems; analyses of groundwater and contaminant flows; and geophysical studies. He is responsible for making recommendations for containment, and for maintaining site health and safety during the field investigations

Groundwater and soil contamination investigation at a manufacturing plant in southeastern Minnesota

Evaluation of existing hydrogeologic conditions surrounding a major chemical plant in Texas

Specialty sampling of offshore sediments prior to dredging operation in northern Indiana

Foundation investigation for additions to automobile manufacturing plants in central Ohio and northeastern Indiana

Evaluation of embankment designs for a sanitary landfill in Illinois

Professional Background

Engineer-in-Training, State of Missouri

MS in Geological Engineering with emphasis in geotechnical engineering and hydrogeology, University of Missouri, Rolla, 1982

BS in Geological Engineering (Magna Cum Laude), University of Missouri, Rolla, 1981

University of Missouri - Rolla, 1981-1982

- Graduate Teaching Assistant in engineering geology, remote sensing and site evaluation, and subsurface exploration
- Developed small calculator programs that quickly interpret and solve well pumping test data

Curators Scholar, 1977-1981

Chancellor's Fellow, 1981-1982

Entered the profession in 1982; joined Sverdrup in 1984

Member - Association of Engineering Geologists
- Missouri Society of Professional Engineers
- Tau Beta Pi, Phi Eta Sigma

IV. SCHEDULE

Our work sequence and estimated schedule to perform the work outlined in our proposal are illustrated below by listing the total calendar days required from your notice to proceed for the sequence of activities. The activities represent specific milestones of the investigation.

Activity	Calendar Day
Notice to Proceed	0
Complete Information Search	21
Compile Background Document	35
Develop Work Plan and Schedule	49
Develop Health and Safety Plan	49
Negotiate Subcontracts	56
Install Monitoring Wells	70
Collect Soil & Sediment Samples	70
Collect Groundwater & Surface Water Samples	84
Compile Analytical and Testing Results	119
Prepare and Issue Report of Findings	140

V. COSTS AND FEE BASIS

The following tabulation provides our estimate of the manhour requirements to perform the proposed work.

	MANHOURS			
Activity	Management	Engineering	Field	Clerical
Information Search	12	104	-	12
Preparation for Field Work	36	148	20	30
Data Collection	24	40	290	6
Sample Analysis & Testing	4	8	-	-
Compile & Report Findings	24	130	-	32
TOTALS	100	430	310*	80

The following tabulation provides our estimate of the direct cost requirements to perform the proposed work.

Direct Cost Area	Dollars
Subcontract - Well Installation	18,000*
Subcontract - Chemical Analysis	42,000
Subcontract - Soil Testing	2,000
Sverdrup Subcontract Fee (5%)	3,100
Principals Time	1,000
Telephone	200
Transportation	300
Word Processing	600
Reproductions	400
Equipment Rental	1,300*
Materials	1,600*
Air Freight (Samples)	1,000
Miscellaneous	1,000
TOTAL DIRECT COSTS	$ 72,500

The following tabulation provides a summary of the estimated costs and fee basis for the proposed work.

Item	Dollars
Salaries	14,600
Salary Related Expenses	5,600
Overhead & Profit (2.15 Factor)	23,200
Direct Costs	72,500
TOTAL FEE	$115,900

* These entries reflect Level B protection during all field work. Significant reductions are possible if the worker protection level can be downgraded for part of the work.

SVERDRUP CORPORATION
STANDARD CONTRACT PROVISIONS
TERMS OF PAYMENT—COST REIMBURSABLE BASIS

A. SALARY COSTS, OVERHEAD & PROFIT

As compensation for our services, we will be reimbursed for the salary costs of our professional, technical and supporting personnel for the time during which they are directly employed in work covered by this agreement, multiplied by a factor of 2.15 to cover overhead and profit.

1. Salary costs are defined as the salaries paid for regular time and overtime (including any premium overtime) worked, plus provision for applicable annual salary related expenses, including sick leave, vacation pay, holiday pay and other ordinary and customary paid time off, bonuses, the employer's portion of social security, unemployment and other payroll taxes, Employee's Retirement and Benefit Plan contributions, employer's portion of group hospitalization and medical insurance, and the cost of worker's compensation insurance.

2. Included in overhead are:
   (a) The salaries of officers, except for technical or advisory services directly applicable to the project.
   (b) The salaries of employees doing general administrative work; also nonproductive professional and technical salaries, including maintenance of staff to provide readiness to serve.
   (c) Rent and costs of light, heat and water; equipment depreciation and maintenance cost; costs of office supplies and reproduction of data for our internal use; general communications expense, including local telephone calls and postage; taxes; insurance premiums and license fees; automotive expense and other transportation and travel expense not chargeable to specific contracts; and other miscellaneous costs.

B. OTHER REIMBURSABLE COSTS

In addition, we will be reimbursed for the following:

1. Travel, subsistence, and incidental expenses of personnel while traveling in connection with the work. The costs of a change of employee's residence are reimbursable if required by the work.

2. Transportation by passenger automobiles that we supply intermittently in connection with the work, at the rate of 21 cents per mile. All costs of owned, leased or rented passenger vehicles assigned to the work and car allowances granted to management and supervisory personnel are reimbursable. Reimbursement for the cost of special types of vehicles will be at rates to be mutually agreed upon when such vehicles are required.

3. Reproduction of drawings, photographs, maps, charts and reports which are prepared for the Client's periodic or interim review and also the cost of the reproductions which constitute the delivery of work.

4. Wire and wireless communication of messages and data in connection with the work.

5. Insurance required by the Client in addition to the coverages or in excess of the limits normally carried.

6. Subcontracted services such as, but not limited to, borings, surveys, photogrammetry, testing and computing services, if required in the performance of the work, plus an amount equal to 5 % thereof to cover cost of handling.

7. Technical support services provided from our own facilities, as required in the performance of the work.

8. Special consultants, as approved by the Client, if required in the performance of the work, plus an amount equal to 10% thereof to cover the cost of handling.

9. Technical and advisory services of officers directly applicable to the project at the hourly rate of $100.

C. TERMS OF PAYMENT

Invoices for actual work performed and cost incurred will be submitted at four-week intervals with payment due upon presentation. Interest of 1% per month (or any lesser legal limit applicable) will be charged on invoice amounts outstanding more than 45 days from invoice date.

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The above provisions are predicated on the work being performed in our regularly established offices and may be subject to revision if separate offices are necessary for project purposes.

SVERDRUP CORPORATION
STANDARD INDEMNIFICATION CONDITIONS

1. Sverdrup will indemnify, defend, and hold harmless Cerro Copper Products from all claims and suits for loss of or damage to property, or personal injury, including death to all persons, including Sverdrup, Sverdrup's employees, agents, or servants, and from all judgments recovered therefore, including court costs and attorney's fees and other expenses, arising out of errors, omissions, or negligent acts of Sverdrup, Sverdrup's employees, agents or servants, subcontractors or their employees, in connection with or as a result of services defined in this proposal.

2. Sverdrup will develop a plan using generally accepted engineering practices and standards for Cerro Copper Products Company approval detailing remedial activities to be taken by Sverdrup to minimize any forseeable releases that may be encountered during execution of the proposed work. However, Cerro Copper Products Company shall defend and indemnify Sverdrup, its consultants, agents, and employees, from and against all claims, damages, losses, and expenses arising out of the performance of the proposed work, or the performance of work by others and which result from the actual, alleged, or threatened discharge, dispersal, release, or escape of any solid, liquid, gaseous, or thermal irritant or contaminant, including smoke, vapor, soot, fumes, acids, alkalis, chemicals, and waste.